

REMARKS

1. General

By the above Amendment, Applicant has amended the specification to reduce prolixity, to standardize terms used in the descriptions, to correct errors of spelling and punctuation, to improve the formatting for readability, and to correct a technical misstatement on page 9, paragraph 5, where "increasing" was inadvertently substituted for "decreasing," in a context where it is obvious that only the latter term makes sense.

The claims have been re-written to overcome the Examiner's objections, and define the Invention more distinctly and patentably over the prior art.

Rule 132 declarations have been provided in the attached Appendices A-E concerning the novelty, unobviousness, and advantages of the Invention as demonstrated by calculation (C, E), the products of the Wener assignee (D), professional recognition (B), and actual measurements (A, C, E).

2. The Objection To The Information Disclosure Statement under 37 CFR 1.98(a)(2) overcome

Applicant's information disclosure statement filed 11/26/03 was objected to under 37 CFR 1.98(a)(2), as failing to include copies of non-patent literature publications that were cited in Applicant's Information Disclosure Statement. Applicant has produced such copies, and provided same together with this Amendment. (attached)

3. The Claims Rejection Under 35 USC § 112

Claims 1-7 were rejected since it was said the claims failed to define the invention in the manner required under 35 U.S.C. § 112, paragraph 2. Accordingly, Applicant has cancelled Claims 1-7, and drafted new Claims 8-29 in a manner that defines the invention more particularly and distinctly, so as to overcome the technical objection and to define the invention patentably over the prior art.

4. The Claims Rejection Under 35 USC § 102 Overcome

Claims 1-7 were rejected under U.S.C. 102(b) as being anticipated by the prior art, and, specifically, as disclosed by US 6,366,028 B1, *Wener*, et. al.

Applicant recognizes that, initially, the Invention's inventive topology may seem subtle, however, this subtlety, if anything, testifies to the unobviousness of the Invention, for it will be shown that the differences in performance and operation of the Invention compared to the prior art are anything but subtle, that the Invention has profound and valuable advantages not known in the prior art, that these and the Invention's novel structure set it apart from the prior art, and that the Invention, as claimed, is patentable under 35 U.S.C. § 102 and 103.

4.1 The Invention Employs a Distinct and Novel Topology

4.1.1 Apparent Similarities Are Superficial

Pursuant to satisfying the requirements under 35 U.S.C. § 102, Applicant submits that the schematic-level similarities between the devices are superficial; that, electrically, a 100nF d.c. blocking capacitor (Fig. 1C, C_{inf}) used in Applicant's invention, for example, is not the same element, and does not perform the same function as the 1nF timing capacitor (Fig. 1B, C_{1B}), disclosed in the cited prior art, and that this feature by itself defines a novel structure.

4.1.2 The Invention Also Teaches A 2nd Novel Configuration

Furthermore, it is respectfully noted that, per the teachings of Applicant's specification (pg. 9, par. 4), d.c.-blocking capacitor C_{inf} is optional in the instant invention, and may be omitted completely, resulting in a structure that is clearly distinct from the cited prior art.

Applicant respectfully submits that the foregoing device, wherein C_{inf} is replaced with a short-circuit as taught in Applicant's specification, creates a patently new structure claimed in Applicant's claims, which is sufficient in and of itself to establish novelty of the claimed invention under 35 U.S.C. § 102.

4.1.3 The Invention's First Configuration Is Also Novel, and Distinct From Wener

The above notwithstanding, and even maintaining C_{inf} in its original position as shown in Applicant's Fig. 2c, Applicant respectfully submits that the crucial, novel structural differences between the Wener device and the instant invention remain. To wit:

Wener, column 5, unambiguously teaches the use of an RC-timer (R3-C3 in Wener's drawings) to establish the converter's off-time:

26 the transistor Q1 connects the [*off-timing*] capacitor C3 to ground which
27 enables the [*off-timing*] capacitor C3 to begin to charge up through the
28 [*off-timing*] resistor R3.

[...]

35 When the
36 capacitor C2 charges sufficiently, the transistor Q1 turns on
37 again, which connects the [*off-timing*] capacitor C3 to ground. This, in
38 turn, causes the [*power-switching*] transistor Q2 to turn off while the capacitor
39 C3 charges up until it has sufficient voltage to turn the
40 transistor Q2 on.

functional descriptions added in brackets []

Clearly, the off-time of Wener's device is controlled by an RC-timer provided for that purpose. Said timer's components include (C3), (R3), and (Q2).

Applicant's claimed invention, by contrast, detects and relies on the *discharge of the inductor* to hold its power-switching transistor off during the pendency of said discharge, thus establishing an off-time.

Each of Applicant's claims incorporates an off-timing interval and/or mechanism regulated by the inductor's discharge time to establish an adaptive off-time for the converter. Wener employs an RC-timer to establish off-time. Applicant respectfully submits said employment is disadvantageous, inferior to, and distinct from Applicant's claimed device.

For the all above reasons, it is respectfully submitted that the claimed invention embodies novel structure satisfying the requirements of patentability under 35 U.S.C. § 102.

4.2 Radically Distinct Component Values Can Define Novel Electronic Structures:

Applicant's Block-Diagram Figures Reflect Unique Configurations

The rejection of claims 1-7 under 35 U.S.C. § 102 implicitly suggests that the structures of the Invention and of the cited prior art device are one and the same. It is respectfully submitted that this is not the case, that the claimed Invention embodies a unique, novel topology that, electronically, is structurally different from that of the prior art, and that apparent similarities are not actual similarities in fact.

By way of explanation, it is respectfully submitted that an amplifier with capacitive feedback can easily be made to perform as an oscillator or a filter by altering the value of that capacitance, yet

no one would claim that an amplifier, oscillator, and filter are the same device, or perform the same function, and no one would argue that circuits employing the various variations were identical because of said employment. Further, though the symbolic representations of the foregoing variations in a schematic diagram would be indistinguishable, the import of said circuit variations would be readily apparent in block diagrams of the respective circuits. Applicant's drawing figures 2a-c supply such block diagrams of the devices relevant to this application, plainly showing the distinct structure, structural elements, and interconnections of each device, and the novelty of Applicant's claimed invention.

4.3 The Wener device employs an RC off-timer, establishing a substantially fixed off-time, whereas the Invention employs an adaptive off-time regulated by discharge of the inductor, constituting a critical structural difference

In the instant invention, the capacitor in the Cinf position is exactly the mechanism for coupling feedback, and, as in the amplifier example above, uniquely positioned to have a profound affect on the operation of and the result produced by Applicant's circuit.

In the Wener device, Wener's capacitor C3 constitutes part of an off-timer, a timing function essential to said device, however, Cinf of the Invention--by force of its greatly increased capacitive value in the Invention--performs no timing function at all, merely serving as a direct coupling, with the added advantage that startup constraints of the oscillator are eased (Cinf allows the converter to start even when Q1C is partially saturated; absent Cinf, greater care must be exercised to prevent such saturation, as taught in Applicant's specification pg. 9, par. 4).

In other words, one device employs the capacitor as part of a timer that does not exist in the other device. Accordingly, it must be concluded that the Wener device and the Invention do not utilize the same functional blocks, and therefore the two devices are not the same, i.e., the Invention is novel.

The alternative theory--that the Invention operates in the same manner as the Wener device, and employs an off-timer with a timing period of R2C multiplied by an infinite or effectively infinite capacitor Cinf--makes no sense: a device depending on such a mode of operation would be inoperative.

In fact, it is this apparent non-sense [sic] of employing an infinite--or effectively infinite--capacitor that reveals, in part, the invention's unobviousness, for the possibility and utility of making the change is not initially apparent even to those skilled in the art.

On reflection, however, the new structure becomes apparent, its new mode of operation plain, and its advantages undeniable, as evidenced by calculation, and by the direct measurements supplied by Applicant in the appendices.

4.4 Further rejection of the Claims under 35 USC § 102(b) overcome

In paragraph 5 of the Office Letter mailed to Applicant 9 September 2005, claims 1-7 were rejected under 35 U.S.C. § 102(b) as follows:

"Applicant's admitted prior art Fig. 1b disclose the claimed invention. The timing capacitors (C2B) and (C1B), resistors (R3B) and (R2B), supply (Vcc), switching transistors Q1B and Q2B and time needed to fully discharge inductor (L1B)."

Applicant most respectfully submits that the above recited structure is not that of the instant Invention, which fact is also addressed in the other sections of these remarks. The question remains, however, as to Wener's teachings with respect to discharge of the inductor.

4.3.1 Wener Teaches A Continuous Mode Device

The Wener patent teaches:

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60 "When the flyback
61 voltage across the inductor L1 added to the 1.5 volts
62 provided by the battery 22 becomes equal to or greater than
63 the threshold turn-on voltage of the LED 16, current starts
64 flowing from the inductor L1 through the LED 16 causing
65 the LED 16 to emit light. When the transistor Q2 opens, the
66 voltage across the LED 16 immediately drops below the
67 threshold of this device and the LED 16 turns off. At

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1 this time, current flows through the inductor L1 and the
2 transistor Q2, and the inductor starts to store energy again
3 in the form of current flow."

Firstly, the description errs: although line 65 reads "When the transistor Q2 opens...," it is clear that "closes" was meant, as opening Q2 could in no way cause the voltage across LED 16 to drop.

This oversight notwithstanding, the passage states plainly that the sudden drop in voltage across LED 16 is preceded by--and hence due to--the action of Q2. Q2, in turn, is driven by the off-timer R3-C3, and it is also plain that the off-time of the Wener device is controlled by this RC-timer, and not regulated by the discharge time of the inductor as taught by the instant invention.

In the instant invention the sequence of events is exactly reversed, and of different causes: in the instant invention, a collapsing field in the inductor--as it finishes its discharge--*creates* a falling voltage at the collector of transistor Q2, and Q2 is only turned "on" a fraction of a microsecond later, as a *consequence* of the sequence of events *initiated by the inductor*. This is a crucial distinction, as it is essential to the invention's control of the inductor current, and the Wener device's lack thereof. This inventive principle of operation forms the core of the Invention's output-stabilizing mechanism.

In contrast with the Invention's teachings of allowing the inductor current to fall exactly to zero during discharge, Wener in fact teaches a continuous mode device in which said inductor current is never non-zero, as

- a) the description of the LED 16 being extinguished by the action of Q2 perforce indicates that the inductor is still discharging, and possesses a non-zero current, and
- b) the duty cycles recited by Wener are insufficient to discharge the inductor, as shown by calculation, and by measurement (Appendix C).

In conclusion of this section therefore, Applicant respectfully submits that Wener does not teach complete discharge of the inductor, discharge to any particular value of inductor current, inductor-control of off-time, or the means to attain the aforementioned. Accordingly, the Wener device does not embody and does not teach the Invention's claimed teachings.

4.4.2 New Principle of Operation

That the Wener device and the instant invention employ different principles of operation can be objectively shown:

The Wener patent teaches a single-cell-powered voltage-boosting converter using a 220 microhenry inductor and an operating frequency of 200-to-600KHz for boosting the 1.5 volts an alkaline cell sufficiently to drive an LED.

In the instant invention, however, the frequency of operation is inflexible; said frequency is fixed uniquely to a particular value dictated by the combination of the value of the inductor, the

supply voltage, the forward voltage of the load, and the desired peak inductor current. To reiterate: one and *only* one solution exists for any given combination of components and the above factors.

In the attached Appendix E (*Rule 132 Declaration E - Calculation of Component Values Needed To Produce Operation According To Inventive Principles*) Applicant shows by rigorous calculation that given the above constraints, and driving a white LED, the only possible frequency of operation consistent with the Invention's inventive principles is approximately 24 kilohertz.

Applicant therefore respectfully submits that the frequencies of operation recited by Wener are *prima facie* evidence that the device taught by Wener does not and cannot embody the Invention or its inventive principles.

4.5 Additional factors demonstrating novelty and unobviousness

4.5.1 Unexpected Results

Applicant submits the unobviousness of the Invention is exemplified by the results achieved by the invention--greater efficiency, lower cost, and output stability over varying supply voltages, as attested to in Appendix A, *Rule 132 Declaration A: Measurements Demonstrating Superior Performance of The Invention*. Applicant respectfully submits that these results are new, unexpected, superior, disproportionate to the seeming subtlety of the new topology, unsuggested by Wener or other prior art, surprising, and critical to the object of making a flashlight producing a stabilized luminous output.

4.5.2 The Invention Omits An Element(s) Required In the Prior Art

As disclosed in Applicant's specification (Operation of the Invention -- Startup, pg. 9 par. 4), the RC off-timer described by Wener is not used by the instant invention. Accordingly, the Invention's d.c.-blocking network can be discarded and replaced with a wire, saving two components (Cinf and R2c), space, and cost.

Furthermore, this modification will not affect the Invention's operating frequency, tON, tOFF, output power, or efficiency, or require the adjustment of any of the remaining components. The Invention's operation is insensitive to the effects of this component. The Wener device's parameters, by contrast, would be drastically altered by such a change, and would need many post-modification component adjustments to provide any useful level of performance.

Applicant respectfully submits that the ability to remove said timer, & these components without affecting the Invention clearly separates and distinguishes the Invention's novel structure from that of the prior art devices.

4.5.3 Fulfils A Long-standing Need

The need for stabilization of an LED flashlight's brightness was already identified on or about April 19, 1995 by Sam Goldwasser (reference #1 in Applicant's Information Disclosure submitted 11/26/2003), however, despite intense public interest in achieving this goal, simple, economical means for accomplishing this object had not been discovered or described in the prior art. Applicant respectfully submits the failure to discover Applicant's invention despite said intense interest is further evidence that the Invention is unobvious.

4.5.4 Professional Recognition

Applicant respectfully submits that the novelty, public need for, unobviousness, and substantial advantages of the invention are further demonstrated by subsequent publication of a third-party device employing the invention's novel topology in EDN magazine. (attached Appendix B: *Rule 132 Declaration B - Professional Recognition of the Invention's Inventive Concepts*)

Identically with Applicant's invention, Schleicher's device comprises an inductor L driven by a transistor switch Q2, which in turn is driven by a timer Q1-R1-C, which in turn is driven by switch Q2 in regenerative fashion. The combination forms an oscillator where the ON-time of said switch Q2 is determined by said timer Q1-R1-C, the ON-time of said timer is made responsive to supply voltage, and where OFF time of said switch Q2 is determined by the discharge time of said inductor L.

Said third-party device employs the invention's novel adaptive off-time regulating mechanism based on the discharge time of its switching inductor, and the invention's on-timing mechanism responsive to Vcc. Accordingly, the device reaps the invention's advantages, as recited in Applicant's specification.

The editors of EDN magazine, an established industry publication, were sufficiently persuaded of the device's merit, novelty, and advantages to feature it in their "Design Ideas" section, a showcase of said magazine reserved for the publication of innovative and original circuit design ideas.

4.5.5 Further evidence of unobviousness: The Invention is not found in products of Wener assignee

Applicant respectfully submits that the novelty and unobviousness of the invention is further demonstrated in that the Infinity Tasklight products of CMG Equipment, LLC, the assignee of the Wener patent, incorporated the Wener device as taught in US 6,366,028 B1, and did not utilize or obtain the benefits of Applicant's inventive topology (attached: *Appendix D: Rule 132 Declaration D – Content of CMG Equipment, LLC, Infinity Tasklight LED Flashlight Products*).

Additional evidence of the instant invention's unobviousness is provided by the fact that at least three revisions known to Applicant were made to the Infinity Tasklight products during the manufacture of same, seemingly intended to improve the circuit, and remedy the deficiencies regarding unpredictable output and poor stability of luminous output noted in Applicant's specification. Despite this active pursuit of improvement, Applicant's inventive architecture was not discovered or employed in CMG Equipment LLC's Infinity Tasklight product(s).

Still further, as attested to in Appendix D, the Wener circuit has subsequently been replaced with more expensive circuitry based on Zetex corporation's ZXSC300 integrated circuit in CMG's latest product, the Infinity Ultra, and in the successor products as manufactured by Gerber, LLC, successor corporation of CMG Equipment LLC. Said replacement circuit secures the advantages of Applicant's invention by different means, at significantly higher cost.

Applicant submits that if the Invention's novel topology were obvious or anticipated by the *Wener* patent, then it would be expected that the owner of said patent, being a manufacturer of products, would be the first and most eager to practice, employ, and utilize the Invention in his products to gain the cost and performance advantages recited in Applicant's specification. Further, it seems apparent that, by changing to the ZXSC300 boost circuit, CMG demonstrates that it was in fact desirous of and seeking same advantages. The products of CMG and Gerber, its successor, however, do not employ the instant invention's inventive concepts.

In conclusion of this section, for the reasons cited above, Applicant respectfully submits, therefore, that Applicant's inventive architecture is novel, was not taught by, anticipated by, or known to Wener et al.--arguably the most skilled and proficient workers in this particular art--and it is therefore demonstrated that the Invention is unobvious to those skilled in the art.

4.5.6 The Invention Exhibits Markedly Superior Performance: Twice as efficient; Drawing Figures 401 & 402 Reflect Actual Measurements

The Invention's performance is markedly superior to the prior art, which Applicant submits is further demonstrative of the Invention's novelty and unobviousness.

Graph **401** and graph **402** of Applicant's drawings, Fig. 4, for example, reflect actual power consumption measurements over a range of operating voltages made of the Wener device and of a working prototype of the instant invention, as attested to in the attached Appendix A (*Rule 132 Declaration A – Measurements Demonstrating Superior Performance of The Invention*). Said graphs make readily apparent the stability advantage of the Invention over the prior art device.

4.5.6.1 Stability Improved By A Factor of 5.7

In Table A-1 of that same appendix, the further improved results of the instant invention are clearly visible: over the 1.5 to 0.9 volt useful range of an alkaline cell, the luminous output of the Wener device declines to 10% of its original value. The Invention, under the same conditions, maintains 57% of its original brightness, a nearly six-fold improvement. Alternate timing current generators taught in Applicant's specification provide even greater stability.

Applicant submits that this advantage, in and of itself, is a surprising, non-obvious result of the Invention's novel topology, and by itself is valuable enough to make the Invention commercially successful.

4.5.6.2 Efficiency, Battery Life Substantially Improved

Additionally, it can be seen from Table A-1's columns "n" that the invention produced approximately twice as much light-per-unit-power input when compared to the prior art device. That is, the invention is nearly twice as efficient as the prior art. This is a crucial advantage in a battery-powered device, as it directly affects the battery life, hence the run-time, and hence the utility of said device. The Invention produces more light, and runs longer.

It is respectfully submitted that these actual measurements of the Invention's superior performance--gained without cost--further demonstrate the novelty and unobviousness of same, else surely Wener or others would have utilized the Invention's novel topology and incorporated its inventive concepts to gain said superior performance. In fact, Applicant respectfully submits that there is no other obvious, rational explanation as to why the benefits of the Invention were not harnessed by Wener and assignee CMG Equipment LLC, except that the Invention was not known, and hence not obvious to or anticipated by Wener.

CONCLUSION

For all the above-cited reasons, Applicant submits that the specification and claims are now in proper form, and that the claims all define patentably over the prior art. Therefore, Applicant submits that this application is now in condition for allowance, which action is respectfully requested.

Conditional Request for Constructive Assistance

Applicant has amended the specification and claims of this application so that they are proper, definite, and define novel structure which is also unobvious. If for any reason this application is not believed to be in full condition for allowance, Applicant respectfully requests the constructive assistance and suggestions of the Examiner pursuant to M.P.E.P. § 2173.02 and § 707.07(j) in order that the undersigned can place this application in allowable condition as soon as possible and without the need for further proceedings.

Very respectfully,



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Enclosures:

- First Substitute Specification, (15) pages, pursuant to 37 CFR § 1.125(b)
- First Substitute Specification, (15) pages, marked to show changes, pursuant to 37 CFR § 1.125(c)
- Copies of articles cited in Applicant's Information Disclosure Statement filed 26 February 2003.

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